

REMARKS

Reconsideration and allowance of the above-identified application are respectfully requested.

Claims 3, 4, 7, 8, 11, 12, 15, 16, 19, 20, 24, 25 and 27-30 are currently pending, wherein claims 3, 15, 24, 29 and 30 are independent. Claims 1, 2, 5-6, 9, 10, 13, 14, 17, 18, 21-23, 26 and 31-33 have been canceled.

In the first section of the Office Action, the drawings are objected to under 37 C.F.R. 1.83(a). In particular, the Patent Office asserts that the feature of the heat sink being “substantially thermally isolated from the planar package substrate” or the step of “thermally isolating the heat sink from the planar package substrate,” as recited in claims 3, 15, 24, 29 and 30 must be shown in the drawings.

Applicant hereby adds new Figure 6, marked “REPLACEMENT SHEET,” for review by the Patent Office in connection with the above-identified application. It is respectfully submitted that Figure 6 illustrates the feature of the heat sink being thermally isolated from the planar package substrate (see, e.g., thermal isolation members 605). The specification has also been amended to include a discussion of Figure 6. Support for the new figures and amendments to the specification can be found at least on page 12 (see original claim 3), page 15 (see original claim 15), and page 18 (see original claim 24). Should the enclosed drawing require changes, it is respectfully requested that the Patent Office notify the undersigned of same. Accordingly, reconsideration and withdrawal of these grounds of objection are respectfully requested.

In the second section of the Office Action, claims 3, 4, 7, 8, 11, 12, 15, 16, 19, 20, 24, 25 and 27-30 are rejected under 35 U.S.C. § 112, second paragraph for alleged indefiniteness.

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IN THE DRAWING FIGURES:

Kindly add Figure 6 on the enclosed one (1) sheet of formal drawing to the above-identified application, the sheet marked "REPLACEMENT SHEET".

In particular, it is unclear and confusing to the Patent Office what is meant and what shows the features of “the heat sink is substantially thermally isolated from the planar package substrate” and “thermally isolating the heat sink from the planar package substrate.” This rejection is respectfully traversed.

It is respectfully submitted that new Figure 6 clearly illustrates the feature of the heat sink being thermally isolated from the planar package substrate (see, e.g., thermal isolation members 605). The specification has also been amended to include a discussion of Figure 6. In particular, the specification has been amended to disclose that

thermal isolation members 605 can be used to thermally isolate the heat sink 22 from the package substrate 26. Each of the thermal isolation members 605 can be made of any suitable material that is capable of thermally isolating the heat sink 22 from the package substrate 26 or otherwise substantially blocking or preventing the transfer of heat from the heat sink to the package substrate 26. [see present application, paragraph 0022.1]

Thus, it is respectfully submitted that claims 3, 4, 7, 8, 11, 12, 15, 16, 19, 20, 24, 25 and 27-30 are clear, precise and particularly point and distinctly claim the subject matter which Applicant regards as the invention, in complete compliance with the mandates of 35 U.S.C. § 112, second paragraph. Accordingly, reconsideration and withdrawal of these grounds of rejection are respectfully requested.

In the third section of the Office Action, claims 2, 14, 23 and 31-33 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Shiraishi et al. (U.S. Patent No. 6,525,414, hereinafter “Shiraishi”) in view of Kato et al. (U.S. Patent No. 5,424,573). It is respectfully noted that this rejection has been rendered moot by the cancellation of claims 2, 14, 23 and 31-33.

In the fourth section of the Office Action, claims 3, 4, 7, 8, 11, 12, 15, 16, 19, 20, 24, 25 and 27-30 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over Shiraishi in view of Tsuji (Japanese Patent No. 1-248543, hereinafter “Tsuji”). This rejection is respectfully traversed.

Exemplary embodiments of the present invention are directed to an integrated chip package that provides a low cost package that is suitable for high-density semiconductors that have high power dissipation. The integrated chip package includes at least one semiconductor chip having a first surface and a second surface. The first surface of the semiconductor chip is electrically coupled to an intermediate substrate via conductive bumps. The intermediate substrate is also electrically coupled to a package substrate via a plurality of bonding wires. The second surface of the semiconductor chip is thermally coupled to a heat sink to increase the power dissipation capacity of the integrated chip package. Consequently, the thermal path of the integrated chip package extends to the heat sink away from the package substrate, thereby reducing the heat load of the circuit board or circuit substrate to which the integrate chip package is connected. [*see* present application, page 5, paragraph 0016] According to an exemplary embodiment of the present invention, the heat sink can be substantially thermally isolated from the package substrate.

Shiraishi discloses a semiconductor device that is made by mounting semiconductor elements on both sides of a wiring board having three-dimensional wiring including inner-via holes. According to Shiraishi, a high operating speed and smaller size are made possible by employing a laminated structure of semiconductor elements without using a chip-on-chip configuration. Semiconductor elements are mounted on both sides of a wiring board having three-dimensional wiring including inner via holes so that the semiconductor elements

oppose each other via the wiring board. The electrodes of the semiconductor elements are connected with each other by the three-dimensional wiring of the wiring board. [see Shiraishi, Abstract]

However, as acknowledged by the Patent Office, Shiraishi does not disclose or suggest the feature of a heat sink having side portions extending towards the planar package surface, the heat sink thermally coupled to the second surface of the semiconductor chip so that heat generated from the at least one semiconductor chip flows towards the heat sink. In addition, as acknowledged by the Patent Office, since Shiraishi does not disclose or suggest a heat sink, it is respectfully noted that Shiraishi does not disclose or suggest the feature of the heat sink being substantially thermally isolated from the package substrate, as recited, for example, in independent claim 3 of the present application.

Tsuji discloses a chip carrier. As illustrated in Figure 1, Tsuji discloses

a cap 5 is made of metal . . . *having a good thermal conduction rate* and on the upper surface, an insulating coating 6 is thinly performed by an inorganic paste (for instance, glass paste) or organic insulating paste (for instance, polyimide, epoxy). TAB IC 7 is facedown mounted on the surface of the board 1 and the leads 8 of TAB IC 7 are connected to the pads 2 for lead. In TAB IC 7, a die is adhered to a cap 5 by an adhesive 9 having a good thermal conductive rate. Next, *the cap 5 is adhered to the board 1 by an adhesive 10 and TAB IC 7 are sealed up*. And finally, *a heat sink 11 is adhered to the upper surface of the cap 5 by an adhesive having a good thermal conductive rate*. [Tsuji, English translation of Abstract (emphasis added)]

Thus, Tsuji discloses that a metallic cap is adhered to a board by an adhesive having a good thermal conductive rate, and a heat sink is adhered to the metallic cap by an adhesive that also has a good thermal conductive rate. Thus, in complete contrast to the present invention, it is respectfully noted that the heat sink disclosed by Tsuji is in thermal *conductivity* with the board through the metallic cap. It is respectfully submitted that *nowhere* does Tsuji disclose

or suggest the feature of a heat sink that is substantially thermally *isolated* from the package substrate. Consequently, it is respectfully submitted that Tsuji does not address the above-identified deficiencies of Shiraishi.

In addition, according to M.P.E.P. § 2143, to establish a *prima facie* case of obviousness, three basic criteria must be met. "First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings."

[M.P.E.P. § 2143] In other words, "[o]bviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art." [M.P.E.P. § 2143.01]

The Patent Office asserts that "it would have been obvious to one of ordinary skill in the art to use Tsuji's adhesive to modify Shiraishi et al.'s adhesive for the purpose of emitting the heat generated by the chip with good efficiency by using a metallic cap having a good thermal conduct." [see Office Action, page 8 – page 9] However, as noted by the Applicant in the previous Amendment, and as acknowledged by the Patent Office, Shiraishi fails to disclose or suggest the feature of "the second surface of the at least one semiconductor chip is adhesively bonded to the heat sink." [see Office Action, page 5] Thus, the Patent Office is attempting to assert a motivation to combine the Tsuji reference with the Shiraishi reference based on a feature that the Patent Office admits is not disclosed by Shiraishi, in contravention to the established tenets of U.S. patent law. Rather, it is respectfully submitted that there is no teaching, suggestion or motivation, either explicitly or implicitly, to combine the

references in the manner suggested by the Patent Office. Consequently, it is respectfully submitted that the Patent Office has not established a *prima facie* case of obviousness. For at least the aforementioned reasons, it is respectfully submitted that the combination of Shiraishi and Tsuji does not render the subject matter of independent claim 1 obvious.

In addition, according to M.P.E.P. § 2142, “[t]o reach a proper determination under 35 U.S.C. 103, . . . impermissible hindsight must be avoided and the legal conclusion [of obviousness] must be reached on the basis of the facts gleaned from the prior art.” Furthermore, according to M.P.E.P. § 2143.01, “[t]he mere fact that references can be . . . modified does not render the resultant combination obvious unless the prior art also suggests the desirability of [such modification].” [citing *In re Mills*, 916 F.2d 680, 16 U.S.P.Q.2d 1430 (Fed. Cir. 1990)] It is respectfully submitted that there is no disclosure or suggestion in Shiraishi regarding any thermal isolation of a heat sink from a package substrate, any use of adhesive bonding of a heat sink to a semiconductor chip, or any discussion of heat sinks in general. It is respectfully submitted that the Patent Office’s stated motivation for combining Tsuji with Shiraishi “to modify Shiraishi et al.’s adhesive” is completely without support in Shiraishi. Therefore, it is respectfully submitted that the Patent Office’s attempt to combine Shiraishi and Tsuji for its rejection based on obviousness is clearly and unequivocally founded upon “knowledge gleaned only from applicant’s disclosure.” [see M.P.E.P. § 2145] Consequently, it is respectfully submitted that the rejection entails hindsight and is, therefore, improper.

Independent claims 15, 24, 29 and 30 recites features similar to those discussed above with respect to independent claim 1, and are, therefore, patentably distinguishable over the

combination of Shiraishi and Tsuji for at least those reasons stated above with regard to independent claim 1.

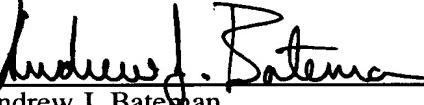
Dependent claims 4, 7, 8, 11, 12, 16, 19, 20, 25, 27 and 28 variously depend from independent claims 3, 15 and 24, and are, therefore, patentably distinguishable over the combination of Shiraishi and Tsuji for at least those reasons stated above with regard to independent claims 3, 15 and 24.

For at least the foregoing reasons, it is respectfully submitted that the combination of Shiraishi and Tsuji does not render the subject matter of claims 3, 4, 7, 8, 11, 12, 15, 16, 19, 20, 24, 25 and 27-30 unpatentable. Accordingly, reconsideration and withdrawal of these grounds of rejection are respectfully requested.

All of the objections and rejections raised in the Office Action having been addressed, it is respectfully submitted that the present application is in condition for allowance and a notice to that effect is earnestly solicited. Should the Examiner have any questions regarding this response or the application in general, the Examiner is urged to contact the Applicant's attorney, Andrew J. Bateman, by telephone at (202) 625-3547. All correspondence should continue to be directed to the address given below.

Respectfully submitted,

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